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The ambiguous infrastructural ideal: the urbanisation of water and power and the 'golden age' of utility networks

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Abstract

Current debates around networks and urban fragmentation focus on the ownership of the service to explain processes of socio-technical differentiation in cities (splintering). In this perspective, integrated public ownership and management historically allowed for service universalization and the emergence of a “modern infrastructural ideal”, whereas recent trends towards privatization and unbundling are seen to foster fragmentation. In this paper, we argue, through an historical appraisal of the rolling out of water and power networks in very different contexts, that ownership is just one of the factors in urban network service provision and management, and that the local socio-political context must be taken into account to understand how and why networks are universalized (or not) and what socio-spatial effects they produce. Beyond ownership, network provision and management thus emerge as a reflection of social dynamics and ties in specific, place-based urban contexts. The aim is thus to challenge the mechanical link that sometimes appears in research between network ownership and territorial fragmentation. With case studies chosen from various socio historical contexts, from Papal Rome to colonial Cape Town, statist Paris to liberal Los Angeles, we argue that, even if ownership remains one of the important key factors in explaining dynamics of ‘splintering’, we must heed the whole framework of governance specific to each situation, which goes far beyond the mere issue of formal network governance. We thus resort to the concept of urban regime, studied in a historical perspective, to situate the socio spatial dynamics of networks, between market forces, and the private interests of elites, and issues pertaining to mechanisms of wider social control, which is where the notion of regulation is useful to us. Moreover, it is necessary to take into account the problematic of the political economy of network utilities, which goes beyond the simple logic of private vs. public ownership.

Recent debates on the potential role of networks of public utilities in processes of urban fragmentation, as illustrated in the seminal research carried out by Stephen Graham and Simon Marvin¹, have shown how important the issue of the socio-spatial diffusion of urban technical networks is: the latter, in conjunction with the urban regimes that plan and develop them according to certain strategies, are now perceived as instrumental in accelerating or even enabling the “coming apart” of cities, or, in other words, their increased polarization through the valorising of “powerful users” and places, accompanied by the parallel exclusion of places and users that are less valued. An era of network deregulation and “unbundling”, ushered in by the rising influence of market-based network operation, is said to have replaced the post-second-world-war “Golden Age” that saw universal access to networks under public control. Thus, in this perspective, networks can sustain tendencies towards fragmentation by their socio-spatial effects.

Through a historical analysis of the social, economic, political and spatial issues of network-building in different cities, we discuss this perspective and open other avenues for reflection. The “urbanisation of water” as we see it is thus not only a process such as the one theorized

¹ Graham and Marvin (2002)

by E. Swyngedouw, but also a reading of what we see as the key points that led to the building of complex urban regimes for the governance of networks². For us, what is at stake is not only the “constraint of flow”, but most of all the building of new social, administrative and economic procedures that urbanize a resource or a technology, i.e., that adapt its implementation to the urban regime, whilst shaping urban regimes through this very process. At the core of discussions about the governance of utilities, we often stumble upon the question of ownership. Entire theories are built upon a typology of network ownership regimes. Far from denying the validity of ownership as a key point in understanding networks, we strive here to discuss its relevance in relation to other possible key points.

The aim of the present paper is thus to examine in a comparative perspective the development of networks of water and power in relation to the issue of urban growth and planning, as well as reflect on the respective influence of private and public companies in different historical, social, economic and spatial contexts. In other words, we take concrete examples of the rolling out of urban technical networks in varied socio-spatial and historical contexts to put theoretical debates in perspective, and challenge assumed visions. Indeed, the paper encompasses such diverse contexts as Africa, North-America and Western Europe from the end of the Nineteenth century to the Middle of the Twentieth century, thus enabling us to build a complex framework of analysis of the dynamic relationship between networks and societies.

The main conclusion is that there is no mechanical link between the development of networked services and social and spatial fragmentation processes. In some contexts, apparent “paradoxes” can even occur: a public company as a challenger against a private monopoly, or a landed oligarchy supporting the municipalization of water, or universalization and a form of social justice through commoditization and intervention of private interests. But if ownership is not the single key factor in universalization, it might be because there is a whole set of complex key factors, the variety of which is linked to the specific socio-spatial contexts and the urban regimes they support. The aim of this paper is then to explore these key factors, in relation with the strategies at stake within urban regimes. Indeed, the focus on ownership is one of the bases of the “splintering urbanism” approach, thus, discussing the importance of ownership is a way of discussing the validity of the latter and to explore paths towards an increasing complexity of the paradigm.

Placing network production in a historical perspective: what does “ownership” mean?

A common representation of the relationship between network ownership and processes of network universalisation focuses on the idea that public ownership and management ensure a fast and socially fair diffusion of the service, while private control of networks is seen as a factor of inequities and patchy diffusion of networks. This may or may not be true currently and in the recent past, but, at any rate, the history of the diffusion of networks in the cities that we have studied is an invitation to challenge these assumed visions of the relation between form of ownership and the socio-spatial dynamics of network development. This does in no way mean that there is no relationship, but just that the relationship, far from being mechanical, needs to be read in a more context-based way.

Both Cape Town and Los Angeles were characterized by municipal ownership of water networks during the periods studied here³, as well as by municipalization of an initially privately owned electric power service; yet the expansion of the networks followed different patterns and rhythms, which shows that the official form of ownership is not a determining factor.

² Swyngedouw (E.), *Social Power and the Urbanisation of Water* (OUP, 2004).

³ 1840-1920 for Cape Town, 1902-1930 for Los Angeles.

In the case of Los Angeles, public ownership of the water service was achieved in 1902, after the approval by the population of a bond issue which enabled the city to purchase the infrastructure of the private *Los Angeles City Water Co* (LACWC). The latter, indeed, had not done a very good job at developing the service in Los Angeles, even though it had considerably improved the situation when compared to the preceding attempts by individual entrepreneurs, which had led to sometimes dramatic failures. The LACWC was the first attempt at making delivering domestic water to LA a business *as such*. Yet, the CEO of the LACWC admitted to seeking a “100 cent return on every dollar invested”⁴, thus neglecting areas of the city that were difficult (hence less profitable) to serve (e.g. hills), or not investing in proper pipes, and keeping a very reduced staff. Moreover, the LACWC did nothing to find a solution to the growing needs of a booming city, i.e. a new and durable source of water in a semi-arid land. Municipalization appeared as a possible response to impending doom for the city and the desires of its elite to make it grow. Under municipal management, increasing resources were allocated to the water service, allowing for a long term solution to the water crisis (the gigantic Owens Valley aqueduct built under the aegis of W.Mulholland between 1906-1913⁵); moreover, the newly formed Water Department committed itself to expanding the service at competitive prices (LA was consistently cheaper than other big US cities during the period), for domestic users, but also for industrial and commercial ones, at very low prices. Innovative solutions (such as charging higher prices for agricultural use of water in the San Fernando Valley north of the city, to fund the construction of the water network there at almost no expense for the department) permitted the department to ensure total coverage of the city, even though it had grown impressively in size and population during the period⁶.

Cape Town provides a different illustration of the case of municipal operation of the water service. Indeed, the context was radically different, that of a British colonial city in Southern Africa, with an essentially strategic use as a point of replenishment for commercial and military ships; thus, access to water for the military was at the heart of the very existence of the city. There appears to have been no explicit desire to universalise the service, as opposed to the case of Los Angeles where the political and economic elites, albeit for various reasons, wanted universalisation to take place. Throughout the period studied, and even though some progress occurred, the water service was marked by often dramatic insufficiency and great social, and in the case of Cape Town (although gradually and through a complex process) (Bickford, 1995) racial inequities. Municipal ownership didn't prevent investments in the water service from being insufficient and directed in priority towards the wealthiest and most powerful social categories (even though a large part of the middle classes shared in the general predicament, because of their living in the upper portions of the city, with no access to water).

The service was also technically backward for a long time, as well as unhygienic (Cape Town suffered a terrible outbreak of bubonic plague in 1901, whereas the rate of various epidemics collapsed in LA after municipalization and the widespread use of chlorination). In 1920, access to water was far from universal, poor neighbourhoods, like District 6 (which concentrated the greatest part of the population) still had to rely on unreliable public fountains⁷; the Cape Peninsula area (which was merged into one unified “City of Cape Town” in the 1910s) was characterized by important geographical (and thus social, due to the distribution of population according to social status) differences in the quantity and quality of water received: some suburbs, such as Wynberg, where the population was exclusively white

⁴ Mulholland, C.

⁵ Kahr, William L., *Water and Power*.

⁶ For references on the development of the water supply in Los Angeles, please see: Mulholland (2000); MacKillop (2003)

⁷ Bickford-Smith (1987).

and middle/upper class, could boast a relatively efficient water supply and service, whereas many others (especially working-class, coloured Woodstock) were characterized by an insufficient supply and bad service. Even though the quest for a sustainable water supply for the Peninsula led to its (reluctant) unification⁸ around Cape Town, and thus fostered at least superficial political integration, the water service itself didn't witness such an evolution towards integration, and remained patchy as well as socially selective.

In the case of electricity, in both cities, a period of private operation of the service was followed by municipalisation. The building of electric networks is a much "lighter" operation than the building of water networks and the return on investment thus appears potentially more attractive to private companies. This explains that private development of the electric service often works out better in terms of diffusion of the service than private operation of the water service.

In Los Angeles, the private *Los Angeles Electric Co.* was founded in the mid 1880s; it concentrated its investments on the profitable downtown area of the city, where all the office buildings were located. But the supply was quickly insufficient in the face of growing demand, and several big consumers- such as the streetcar companies⁹- started to generate their own power. At the turn of the century, several small private electric companies operating in LA merged and formed what would become the gigantic *Southern California Edison* (SoCalEd). Although Edison increased its investments, they remained concentrated on the downtown area and emerging industrial areas, such as the San Pedro harbour zone south of the city. Moreover, the emergence of other private competitors (*Pacific Light and Power*, *Los Angeles Gas and Electric*) with each their own technical standards and pricing policies made the market complicated and fragmented, while the practice of making small consumers subsidise big ones (by charging the former much more than the cost of production, and the latter, much less) precluded maximum diffusion of the service, even though the power market grew fast in LA.

A policy of universalisation via municipal operation of the service was initiated "by accident" in 1916, since it was not intended that the city enter the power business, with the switching on of the city's first power plant, which could generate cheap power thanks to the Owens Valley aqueduct (thus, municipal water subsidized municipal power, making the case for an integration of both services under the aegis of a municipal department). The city's *Bureau of Power and Light* became a challenger to private operators, and gradually pushed them towards bankruptcy with its cheap hydropower. In 1922 the *Bureau of Power and Light* purchased *SoCalEd*, and gradually took ownership of the other operators. It pursued a policy of universalization through low prices and ensured universal access to municipal power at the end of the 1930s¹⁰, which saw the emergence of the unified Los Angeles Department of Water and Power (LADWP), still in charge today.

In the case of Cape Town, the production of electric power started in 1893, with the building and operating of a small plant by the German company Siemens-Halske, paid for by the municipality. Rapidly, the city put an end to its contract with the firm and decided to manage the service itself, due to widespread dissatisfaction with the quality of service and the growing

⁸ Duncan (1991)

⁹ The *Los Angeles Electric Railway* and *Pacific Electric*, headed by tycoons Sherman and Huntington, were big players in the shaping of Los Angeles, through their ownership of vast swathes of land and control of the transportation network. They were also big clients for private electric companies, to whom they were often tied by relationships, capitalistic or not. For more on this, see: Mulholland C., Kahrl W. L., Sitton, Deverell (eds.).

¹⁰ MacKillop (2003).

delays to be connected to it¹¹. The electric service was rapidly envisioned as a cash machine for the city (selling expensive power to rich citizens¹², not universalising the service or stimulating industrial and commercial use), and current was sold at high prices, thus limiting the number of customers to less than a hundred at the turn of the century; what's more, the city was already struggling to cope with such a modest load, due to insufficient capacity and reliance on the old-fashioned central station architecture. Moreover, Cape Town did not have the benefit of readily available sources of water to produce cheap hydro-power. The beginning of the 20th century was marked by the concentration of investments on the central districts of the city, the business area, as well as the building of a new plant essentially designed to supply the Colonial Government (Harbour Board and railways) in bulk, thus maintaining the use of the plant as a cash machine for the municipality; this also illustrates the fact that power production in Cape Town, as well as water management, were submitted to the policies of the colonial government and its needs, thereby showing the importance, from a regulation perspective, and in the context of uneven development mediated by colonialism, of global relations of power and dependence on the operation of local utilities. Moreover, the few industrial and commercial clients were subsidised by benefiting from power sold under the cost of production. Thus, the number of private clients only grew in the wealthiest categories (production capacities allowing: many demands had to be turned down due to a limited capacity of the system) and not in the poorer districts¹³.

As we can see, neither the provision of electricity, nor the water service, could be considered anywhere near universal at the end of the period we studied.

In Rome, the issue of the universalisation of the provision of water was dealt with in the context of a complex situation regarding ownership: in Papal Rome, from the time of the Renaissance, this service was traditionally a matter of government competence. It was also a matter of prestige for the Pope, and his image as a good ruler was promoted through public works. The provision of water to the city often served as an occasion to celebrate the efficiency of Papal rule, and each time a new aqueduct was put in service or an ancient aqueduct fixed, a monumental fountain was built to recall to role of the Pope. But a few years before he lost his capital city, seized in 1870 by Italy, Pope Pio IX decided to implement a great reform in the field of the provision of water, by giving a private company a concession. This company, the Acqua Marcia (later renamed Acqua Pia *in honorem* Pio IX), was given in 1865 the exclusive right to transfer water from the renowned Marcia spring. The 1865 concession, which was meant to expire in 1964, did not provide the company with a formal monopoly, but gave it a great advantage. The concession was attributed to Niccola Moraldi, Giovanni Enrico (John Henry) Fawcett and Giacomo (Jack) Shepherd¹⁴ with the clear intent of protecting Catholic interests in the city. Two of the three businessmen were English, and Catholic and English funds were invested. This project reflects the way in which the Papacy was inserted into international financial networks and the way in which privatization was intended as a protection against a possible seizure of the town by Italy. The creation of the new corporation was later confirmed by the Pontifical Ministry of Trade and Public Works, on March 24, 1868, at which point the concession was given the legal status necessary to its continuation in the case of a change in sovereignty. The new service was inaugurated in September 1870, only ten days before the city was seized by Italian troops. And when Rome was formally integrated into the Italian Kingdom, becoming its new capital city, the

¹¹ Mayor's Minute, Years 1893-1895, City of Cape Town.

¹² Even though street lighting was developed in a somewhat more inclusive way.

¹³ MacKillop (2004).

¹⁴ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 1, Fasc. 27. Raccolta di documenti Comune di Roma / Società dell'acqua Pia.

concession was confirmed, as the Italian government was obliged to recognize deals made by the previous government. The municipality, reformed according to Italian law, only got control over three minor aqueducts, with no right to extend its network. The 1865 concession was clearly a way for the Pope to keep control of a major urban service despite the loss of sovereignty and avoid being dependent on another authority.

What is interesting is that even in such a situation, universalisation did not depend on ownership. Between 1870 and the beginning of the XXth century, the Acqua Marcia company was obliged to extend its network even towards the poorer parts of the city, whatever the political context: when conservative Catholics close to its shareholders ruled the municipality, they had to act so as not to appear too insensitive to the situation of the inhabitants, and when the municipality was in the hands of the Progressives, the private company generally had to accept negotiations over the provision of water to new neighbourhoods.

Pressure from inhabitants generally proved efficient, as everybody knew that the company was owned by a few families of Catholic aldermen. If they wanted to keep benefiting from popular confidence, they had to take into account major demands for better life, in a way that recalls the old-regime situation.

Pressure from the municipal council also proved efficient: obliging the company to accept unprofitable extensions of its network was a way to make the whole concession acceptable. And for the company, accepting to serve unprofitable parts of the city served as a way to protect the concession against major legal and political attacks by the municipality when it was in the hands of the Progressives. Universalisation, in this context, came as a political and social duty imposed to the company by the functioning of the whole urban system. In a first phase, extension of the network towards poorer parts of the city generally took place after a petition of inhabitants had been sent to the municipal council and a prominent person¹⁵.

In a second phase (1905-1950), when the municipality tried to develop its own service by building new aqueducts, the private company chose to forego any major investments and waited for the 1964 deadline and the unification of the service. But universalisation was on its way, as the municipal service served ever more neighbourhoods. What is remarkable is that in 1964, when the concession expired and the whole service became municipal, no real difference in service could be felt between parts of the town served by the municipal or the private company. This does not mean that no difference in service existed, but just that ownership was not the major issue.

Electricity in Rome, just like in many other cities, was first used as an alternative to gas street lighting. Gas had enjoyed a huge growth since the middle of the XIXth century. In 1847, a company founded by the Trouvé brothers obtained the first concession. The company, in 1849, was christened "Imperial City of Rome and Italian Gas Light and Coke Company". But the most important initiative came from Jack Sheperd: in 1852 he founded the "Società Anglo Romana per l'Illuminazione a Gas di Roma" and managed to unify the service in the whole city under the aegis of this new entity. When Sheperd died in 1869, after having created the water company Acqua Marcia, the Anglo Romana was run by Pouchain (Poggi, 1971). After the Italian government had taken control of Rome, the company, thanks to the concession agreement granted by the previous government, managed to keep its prerogatives. It began developing an electrical service in 1882. Engineer Guglielmo Mengarini was in charge of choosing and developing the best technical solution for Rome. After some initial experiments, mostly in the field of illumination, powered by a provisional plant situated in the Termini train station, the first power plant was created in 1885 next to the gas plant in via De' Cerchi. From 1886 service also began for private subscribers, initially in the neighbourhood of Piazza Colonna. But most of the buildings served during this first phase were dedicated to public use

¹⁵ Archivio Storico Capitolino, Ufficio V, Direzione.

(the Parliament, many theatres...). Private subscription remained an exception. But when in 1892 the nascent Roman network was connected to the newly created Tivoli hydropower plant, new perspectives emerged. From the very beginning in Rome, electricity was linked to the provision of water: not only was the founder of the gas company, which later became the gas and power company, given the concession on the provision of water in 1865, but also the technical development of the network was linked to the region of Tivoli and its exceptional water resource.

The distribution network was developed according to a radial morphology from the transformation station of Porta Pia¹⁶. Power entered into town from more or less the same point than water. The first phase in the development of subscription was conducted by a private company. But in 1907, Mayor Ernesto Nathan, leader of a Progressive coalition, decided to create a municipal power company, as a challenger to the private Anglo-Romana. This was not a municipalisation of the existing private company, but the creation *ex-nihilo* of a municipal company to challenge the private one. Progressives thought that the Anglo-Romana was not intent on developing a service adapted to the needs of the municipality, and of the general public, at an acceptable price. Engineer Giovanni Montemartini was asked to implement the project. He first had a plant built in San Paolo and the first kilometres of cable installed in the city. The system was later completed by a hydro power plant on river Aniene. In spite of the collaboration between the two companies, through a consortium (1924), for the production of power in Tivoli, distribution remained separate for decades. In the 1920s and 1930s, the development of the domestic uses of electricity, and of the number of subscriptions, took place in the context of a dual system: a former private monopoly, and a new public challenger.

In Paris, the situation was very different, but in the end, universalisation followed a parallel path. The provision of water, and more generally the competence over water resources, had become municipal, and remained so during the XIXth century. But two innovations took place: the increasing role of the state alongside that of a private company. From the time of Napoleon, and then again from the 1830's, modernising the capital city became a priority, and Paris' municipal technical services were under increasing control of state engineers. This situation came to a head during the IId Empire, under governor Hausmann. On the other hand, the private sector also managed to strengthen its positions. In 1860 the Compagnie Générale des Eaux was given a 50-year concession in Paris. But municipal services, ruled by state engineers, remained in charge of technical matters and of decisions about extensions of the network. The apparent privatization was only a privatization of the billing function, not of the infrastructure, not of the technical personnel. Privatization, in a way, accompanied commoditization, and was used as a tool both to soften its effects and to insert a more aggressive commercial dimension into public service. From 1860 a peculiar situation arose in Paris: a municipal public service, run by state personnel, the financial exploitation of which was handed over to a private company. But studies on the extension of the network and on choices about discrimination in the service, social or spatial, show that no link can be established between the organisational scheme and the general policy. Matters of hygiene and rationality in the development of the network seem much more important.

The universalization of the access to tap water in Paris occurred in two phases. In a first phase, the municipal service provided access through public fountains. One can estimate that in the 1860s every inhabitant of the city had access to such a fountain not far from home. This can be considered as a first age, in minor, in the universalization of access to water. The universalization of home access took place in this context of an already publicly subsidized access through fountains. And the study of this process in Paris shows that the fact that the

¹⁶ Idem.

distribution of water (not the production, nor the management of the network) was in the hands of a private company did not specifically influence the rhythm of universalization. At every stage of the process, public intervention softened the rule of the market that the private company would have been eager to apply. Not only were investment in the network and its management public, but public subsidies were used every time the growth of the rate of connection encountered a new obstacle. Reforms of the pricing policy were also implemented on several occasions in this period. In the long term, spatial inequities between different parts of the city also appear as irrelevant. This does not mean that temporary inequities did not exist, nor that they were not relevant in the life of inhabitants, but just that the network in itself can not be seen as a factor of urban fragmentation, and that on the contrary the development of the network had a corrective effect. As for electricity, the evolution in Paris is similar: in the 1920s, universalization was progressively achieved in a situation in which a private company (Compagnie Parisienne de Distribution d'Electricité) received major subsidies from the municipality for the development of the network and for the provision of power to larger parts of the population¹⁷.

These examples show that the ownership of utilities does not necessarily determine the universalisation of the service and its rhythm. The importance of the local *context* must thus be emphasised and analysed carefully, because the concepts of “private” and “public” ownership correspond to different realities according to the context in which they take place, that is, the particular urban regimes that form the backcloth of city life and development: the “official” discourse on universal access in LA masked the land and resource grab carried out by the “oligarchy”; in Cape Town, public ownership coexisted just fine with the obliteration of entire segments of the population from network access, and even an inflexion towards helping “the deserving poor”¹⁸ (i.e. whites, seen as “willing to work”, vs. blacks, seen as inherently unfit for work, just a “degenerate residuum”), at the end of the 19th century, didn’t materialize in any real bettering of their situation. In Rome, the private ownership of the company was due to specific historical events, and the fact of the company being private did not exonerate its owners from taking into account the local social situation and the general demand for an efficient public service. What counts is the whole context of network governance. In Paris, the matter of ownership was more complicated than one might think. The concession to a private company did not prevent either the state through its technical bodies, nor the municipality through the institutional and financial role of its services, to shape the governance of the network and to be determinant actors in the issue of universalization.

We must thus question these terms and uncover the political nature of networks: they are not “neutral” or “just” technology, but tools in political issues and projects. Thus, their socio-spatial development, and the question of pricing, are *political* issues.

Challenging the political neutrality of technology: networks as socio-technical constructs.

The building of urban technical networks, their subsequent universalisation (or not), the technical and pricing choices that structured networks of water and power in the cities that we have studied, were in no way the fruit of a linear process, a “rational” voyage towards the networked cities that Paris, Rome, Los Angeles, and, albeit less comprehensively, Cape Town, are today. Networks were built according to political ideals and choices, they were

¹⁷ Archives de la Seine, VO801- 1683.

¹⁸ Bickford-Smith (1986)

enmeshed in political controversies and struggles between social groups to defend ideals and sometimes, plain material interests. It is necessary to uncover the political *stratum* on which these networks were predicated, in order to understand their evolution and their social and territorial impacts.

In Los Angeles, network building and subsequent universalisation were in no way the fruit of a spontaneous process or the result of purely philanthropic goals (such as making city dwellers' lives "better"). Indeed, the municipalisation of water was first envisioned in a very pragmatic way, and was brought about through a no less pragmatic agreement, both formal and informal, between various components of the city's political and economic elite. The city's economic "oligarchy"¹⁹ (real estate promoters, railway magnates, bankers...all united behind Harrison Gray Otis, owner of the *Los Angeles Times*) foresaw that only massive municipal investment could bring the water required to develop the arid San Fernando Valley, and open it to agriculture and massive settlement. Aware of the building of the aqueduct, thanks to the presence of members of the oligarchy on the city's water board²⁰, these businessmen purchased vast swathes of the then-cheap land, and were able to make a fortune once water made it developable.

Their longer term interest was also to make water easily available throughout the city, to stimulate its growth, commercial and industrial activities, and the city's- and later the region's- general prosperity. This goal of prosperity was shared by the population at large; it was also shared by the Progressives, a very influential political force in US cities (1900-1920), in favour of public ownership of utilities (to make utilities the "people's utilities"), curbing the influence of private enterprise, and also ensuring widespread access to water and power as a way of enhancing people's lives in general. The Progressives were also influenced (just like most of the population) by the idea of a "City Beautiful", with luscious vegetation and wide, open spaces, then envisioned as the model for future cities²¹.

Thus, spreading out the networks was a way of spreading out the city, and, also, in practice, adapting to and supporting its tendency to sprawl, for a variety of reasons: the configuration of the network, the investments decided, the technical characteristics of the system, were deeply rooted in political ideals and decisions, clear choices that united distinct groups of the population of LA behind the municipalisation of water and the massive investments in the water service.

This political (in the widest sense of the mechanisms of a polity) aspect of the issue appears even clearer when the question of water is contrasted with what happened with electricity. Indeed, municipalisation of power was only completed in 1936, by phases, producing a rather fragmented electric service throughout the metropolis (different technical standards, different pricing ...) and inequities between users (industrial users subsidised by private consumers for instance). The municipal venture into the field of electricity generation and distribution, from the 1910s, was initiated almost by stealth. Indeed, the "oligarchy", which had supported the municipalisation of water, strongly opposed that of power, because it interfered with the business of many oligarchs (or that of their connections in private power companies), and also because they had no clear interest in municipal control of the service. Moreover, the "Progressives" were not a monolithic group, and some of them were not opposed to private power in a city where public ownership of utilities was and had always been a rarity, which, once again, underlines the specificity of the political compact that permitted municipalisation of water and then of power, at a particular moment of history, in the particular context of LA political life at that time.

¹⁹ To use the expression coined by Davis (1990).

²⁰ Such as Moses Sherman, a businessman who at one time was the boss of a big streetcar company.

²¹ Jackson (1987)

In Cape Town, the importance of the specific political context played an equally fundamental role in the development of water and power grids. In marked contrast with Los Angeles, universalisation of networks was never a goal; it was certainly not a goal of the “Dirty Party”, a coalition of land and real-estate owners of mainly Dutch origin, in favour of “economy” in the field of urban investments, i.e. keeping expenditures down to keep rates down. They did nothing to find a long term solution to the growing lack of water in the city (and the whole Cape Peninsula: scorn was their approach to municipalities wanting to cooperate with the “Mother City”), and were quite content with a series of (uncoordinated) makeshift solutions to the water supply problem, that basically led to generalized bad service (the “dribble” system, unhygienic, open to fraud and costly, instead of the “full bore” for the provision of water), and even worse service for the poor, who had to depend on public fountains that ended up being cut off most of the day, or, when they worked, were often contaminated due to the parlous state of sanitation in the city (itself linked to insufficient water)²²! This fostered epidemics and hindered the growth of the city. In an apparently paradoxical situation, the “Dirties” were supported by most of the poor (most of whom were Black or Coloured) who also wanted to keep rates down, in order to be able to afford the rent...

The poor were no better off when the “Clean Party”²³ was in power (from 1882 to 1890 and in the 1910s) : this alliance of English-speaking businessmen (as opposed to old-style rentiers) had an interest in a better water supply, both economic (more water for industry, shipping, breweries) and ideological: this bourgeoisie built a Victorian-influenced concept of “cleanliness” related to “Englishness”, the idea that Cape Town had to be cleansed of its African heritage, seen as a culture of “filth and vice”. Thus emerged the idea that most of the poor neighbourhoods (which happened to be mainly “Coloured” or Black), such as District 6, were hopelessly filthy and could be neglected²⁴, while the “useful” parts of the city (the business district, city hall...) were to benefit from the bulk of the investment in networks to make the city more profitable and amenable to business. The social “residuum” was gradually evacuated towards “locations”, such as that of Uitvlugt, outside the city, and given a limited water supply to maintain the working force. We therefore have a prime example of a network “bypass” in favour of powerful users/spaces...organized by a municipal utility, not by a private company.

Thus, water and power supply progressed in some parts of the city, as well as in the wealthy (white) suburbs of the city, but remained globally deficient in poor neighbourhoods. Moreover, for “Cleans” and “Dirties” alike, water and power were often seen as cash machines, a commodity that could be sold in the city (and in the dependent suburbs of Cape Town) at a premium, in order to reduce city rates; thus, water and power users, whatever their social status, subsidised the wealthy rate-payers of the city. Even though water and power in Cape Town were under municipal control, like in Los Angeles, the process of network building and development was quite different and did not give way to universalisation. The social (and, in this case, racial, since in Cape Town race and class are very close concepts) bias introduced in the access to networks can still be felt today: even though most of the city, broadly speaking, enjoys a high rate of connection, important parts of the population are poorly or not connected, and the (socio-) racial connection bias lives on.

In Rome, the water company acted as a political body from its very creation. Conceived as a way to protect Catholic interests in the city even after it was lost by the Pope, the Acqua

²² Van Heyningen (1989).

²³ Bickford-Smith (1983)

²⁴ Bickford-Smith (1987)

Marcia Corporation followed all the major political changes in urban life between 1865 and 1964, when it appeared to be the object of a complex political construction, made to prevent Catholic interests from losing power in the Eternal City. Shareholders and board members of the company were predominantly members of the Roman aristocracy and at the same time conservative members of the municipal council. When it became clear that the city was to become the capital city of Italy, Catholic capital was invested in technical modernisation and in public services.

Between 1870 and 1885 several attempts were made by Progressive members of the municipal council to change this situation, but with little success. In 1872, and then again in 1882, mayor Pianciani tried to advance municipal provision of water, but couldn't succeed because of the 1865 concession. The issue of water came on the agenda as a symbol of a political dominance inherited from the past and given by the Pope to the city as a legacy and a way to exert control over municipal affairs. Water was always the object of political interpretations, and a reflection of debates on the institutional organisation of the capital city. In 1885, the Conservatives tried to adapt the water company to the new local political context, in order not to be exposed to the opposition's blame in a way that could endanger the whole domination of their group on the municipal scene. After the return of Pianciani as a mayor, and his second fall against a conservative alliance, the municipal administration was led by Duke Leopoldo Torlonia. He was one of the major landlords in town, owned hundreds of hectares of land, had earned a fortune in selling a part of it and represented on the local political scene the epitome of the convergence at work between Conservatives of both sides, Catholic and National (Ciampani, 2000). Negotiation with the water company was part of the deal: an apparent easing of the domination of the private company against the guarantee that it would last. But it can also be read differently: the Company agreed to sell some water to the poor at a reduced price, and the Municipality let it earn high profits with the rest of the population. Negotiations were led, in the name of the municipal technical services, by engineer Angelo Vescovali. He was the head of the hydraulic service²⁵. An agreement was finally found, for a period of 25 years (1885-1910). On December 2, 1885, the Acqua Marcia was granted the exclusivity on any new aqueduct construction²⁶. In exchange, it accepted to comply with some demands of the municipal service like the implementation of reduced prices for some categories of the population. The municipality also accepted to renounce its quest for new subscribers and to limit the expansion of its own network to the sole fulfilment of municipal and industrial needs. As a compensation, in order to satisfy a demand for social equity, the company accepted to serve eight public water points in the surroundings of Rome. At a time in which rural zones in the vicinity of Rome were progressively becoming lower-class suburbs and were rarely served by public services, this was a way for the company to improve its reputation, and for the municipality to avoid having to do the works itself. In this case, universalisation came with a difference in the quality of service. But a few years later improvements were done, after demands by inhabitants. The company also had to grant industrial workers' houses (when designated as such by municipal services) preferential prices. This social measure, which may seem important, was of little significance for the company: official workers' houses were few, and projects for construction, such as those promoted when Pianciani was mayor, were even fewer.

Thanks to these few concessions during an important moment in local political life, the company managed to reinforce its *de facto* monopoly. Mayor Torlonia wished to grant the company a 40-year advantage. But facing opposition of a part of the Municipal Council, he had to accept to limit this period to 25 years. Torlonia gave the Acqua Marcia in 1885 the

²⁵ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 17, Fasc. 29. *Relazione dell'ing. A. Vescovali al Sindaco di Roma sulle acque potabili che il Comune potrà utilizzare*. 1885.

²⁶ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 2, Fasc. 2.

perspective of great and long-lasting profits anyway: social measures were symbolic, and the main point was the elimination of the threat of any upgrading of the municipal service. Once again the water service was treated as a political matter. And once again, universalisation found its way in a not necessarily favourable situation.

In 1888, the Municipality tried to propose some new measures,²⁷ because the Progressive opposition inside the municipal council denounced the collusion between Torlonia and the Acqua Marcia, and the way in which municipal interests were mistreated. Torlonia was forced to create a commission. F. Nobili-Vitelleschi wrote the report. He proposed an interpretation of the 1885 convention that could allow municipal services to extend their network. As long as the municipal council remained in the hands of Conservatives, nothing was done. But the debate was launched.

In 1897-1898, a new controversy between the municipality and the water company broke out, about service in the *Agro Romano*, the surroundings of Rome²⁸. In 1893, the company decided to discontinue free service to some fountains²⁹, and it appears that at the turn of the century the company tried to pull out of non profitable operations, a decision which was politically sensitive for the municipality.

The Giolitti Act of March 29, 1903, gave municipalities the possibility to municipalize public services, namely water, transportation, telephone, energy (Calabi, 1980; Gaspari, 2000). A municipal provision of water was the most emblematic proposal, and its social implications were underlined by its promoters. In Rome, the Conservatives, unsurprisingly, chose not to proceed with municipalisation.

The debate flared anew when Mayor Ernesto Nathan came into office. Municipalisation was at the heart of the electoral campaign of 1907. The Progressive coalition, led by Nathan, stayed longer in charge than the two former led by Pianciani. Nathan remained in office until 1912. His coalition included Democrats, Radicals, Socialists and Republicans. It benefited from the contemporary presence of Giolitti at the head of the Italian central government. Nathan succeeded in contesting the aristocratic hegemony on urban life and economic matters: public transportation was municipalized and a municipal power company was created.

A local referendum was organised on September 20, 1909 and municipalisation was approved. The government approved it too. But it was a different problem for water. The fact was that municipalisation of the provision of water was not possible in Rome, since it would have violated the terms of the 1865 concession and of the 1885 convention. It was politically impossible for any Italian government to validate the spoliation of the interests of the Catholic world in such an aggressive way. Municipalisation was demanded by the most leftist members of the Nathan coalition, but remained out of reach because of its diplomatic implications. The municipality itself, having signed the 1885 convention, had no right to ask for municipalisation. Any measure would have not only been politically sensitive, it would also have been invalidated by court decisions. The path towards municipalisation was closed for Nathan.

The only other way to contest the monopoly of the private company was to find a way to improve the public municipal service and get the right to extend it.

At the beginning of the XXth century, the municipal service provided water to only a small part of the city. The issue for Nathan was on the one hand to serve a wider area, and, on the other, to provide better water quality, in order to be able to compete with the private service. Under Nathan, the Vergine aqueduct was equipped with a pressurisation device, in order to deliver water to higher floors in apartment houses. Municipal services also tried to promote a

²⁷ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 2, fasc. 22.

²⁸ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 1, Fasc. 13.

²⁹ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 2, Fasc. 22 and busta 3, fasc. 19.

favourable interpretation of the 1885 convention: they bought Acqua Marcia water and resold it through municipal aqueducts. Municipal engineers also began to study the possibility of diverting water from the Pescheria River, more than 100 km away. The time line, in that case, was 1910, and the end of the 1885 agreement. If municipalisation was impossible, it was possible, from 1910 on, to develop the municipal service as a competitor to the private one. Municipal engineer Mario Moretti submitted in 1906 an ambitious project for the development of the municipal provision of water³⁰. The proposal was discussed at the Municipal Council of April 2, 1906. The idea was to use the Traino aqueduct. Moretti's proposal had two sides: some works to be done immediately, and some others later, in the perspective of 1910 and the end of the 1885 convention, in order to strengthen the municipal service.

Since the 1890s, the question of the surroundings of Rome was of great importance again. As the Acqua Marcia Company had clearly demonstrated that it had no intention to serve that area (the investment was much too high and the profit to be expected too low), municipal services stepped in with their own supply projects, which was a way of challenging the power of the Acqua Marcia company. From 1908 to 1913, municipal services surveyed the Pescheria River. But the end of the 1885 convention had little effect: the Nathan coalition fell shortly after. After the War, the municipality was in the hands of conservative Catholics again, with Mayor Colonna. Once again, political change in Rome proved crucial in decision making processes concerning public utilities.

It was only when the Municipality became a Governorate, under Fascist rule, that projects were promoted again. There were still only two ways of intervening: the development of the public network, and pressure on the private company. The Pescheria project was revisited in 1937, but it was not enough to challenge the company yet. The Vergine Aqueduct was also the object of heavy investments.

In 1937, the gubernatorial (ex-municipal) electric company and the gubernatorial (ex-municipal) water service merged. The new public company was called AGEA (Azienda Governatoriale Elettricità Acqua). After pressure from the Fascist government, a convention was signed in 1938 between AGEA and Acqua Marcia: the private company kept its historical base of subscribers (and the profits it provided) whereas some parts of the city to be equipped (and the investments required) were handed over to the public company³¹. Thus, universalisation of the service was achieved through the intervention of the public service.

In 1944, with the return of the previous municipal organisation, AGEA became ACEA (municipal). When the waters of Rio Pescheria arrived, in 1949, the public service experienced a rapid growth. ACEA also benefited from special financing measures, as defined in the 1953 special law for Rome. Thanks to new funds, the Pescheria works started again. An 84 km gallery was built. Since the 1930s, Acqua Marcia was only expecting the end of the concession and making money from its old subscribers. At the end of the concession in 1964 its services were integrated into ACEA. It was a *de facto* municipalisation. But what the Roman case shows is that the political stakes were always very high. At every period of its development the network was the object of intense political investments, and the decision-making process cannot be understood without taking this dimension into account.

In Paris, the political role of networks was apparently less marked, as neither the ideological split nor the institutional struggle were as strong as in Rome, but it was still very important, mostly in the definition of the institutional frame of the capital city. The provision of water was during the whole period the matter of a constant struggle between the municipality and the state. The fact that it was given to a private company, in 1860, introduced only few

³⁰ Archivio Storico Capitolino, Ufficio V, Direzione, Busta 20, Fasc. 2.

³¹ Archivio Storico Capitolino, Convenzione 28-7-1938.

changes. The peculiarity of Paris might be in the importance of the question of the provision of water for the image of the central government. Although the competence was municipal, with a delegation to a private company, what was at stake in Paris was often the capacity of the government to both modernize its capital city and ensure social equity. In this case, the period of the 2d Empire (1852-1870) is crucial: a dictatorial technocracy led to the greatest achievements ever in the process of universalization, showing that even the relationship between democracy and universal service responds to more complex stakes that often admitted.

Conclusion

What appears with the study of these examples is the fact that networks are objects of complex processes of governance, and that their management is fully inserted into a wider frame in which many elements intervene to alter what could be a mere technical vision. Thus, the nexus between networks and fragmentation is more complex than one could think. This is not to say that a network does not produce fragmentation. Temporary fragmentation, common in the processes we describe, is still fragmentation, and is felt as such by inhabitants. Our point is just that in the end universalisation takes place and that ownership is not a determining issue in the different stages of the process. But there are also other sorts of discrimination: quality of service (different springs, pressure). If in Rome it is clear that social situations were not necessarily an issue and that topography was much more important, at least between 1870 and 1910, it does not exclude the occurrence of spatial discriminations in other cities. What is to be discussed is mostly the character of the provision of water as a speculative operation when the purview of a private company. The various examples we have examined, though not excluding of course the pursuit of profit, show that even a private company is obliged to respect a certain social agenda, in the context of a system of governance that precludes the mere quest for profit, and, most of all, even in the case of a privately operated service, public institutions intervene both to make the company moderate its views and to subsidize the provision of the service for poorer parts of the city.

The current trend towards privatisation and “unbundling” (dissociation of production, transportation and distribution) of networked urban services³² is seen by some researchers, via the “commodification” of services that it seems to imply, as a major factor of urban fragmentation, i.e. the “coming apart” of cities, for instance through the inequities induced by new pricing practices, or the “bypassing” of the poorer, less profitable users. This could be opposed to a “golden age” of urban networks under the aegis of integrated, public operators that ensured greater social justice. But the study of the history of networks in our panel of cities shows that things are more complex, and that the differential treatment of users is not necessarily to their detriment, and, conversely that the public management of utilities does not always imply a fairer and equal treatment of all users. Studying the concrete history of utilities is a way of building an informed critique of a supposed “golden age”.

Actually there was no “golden age” of public service, and, conversely, no dark age of network construction either. Discrimination, social and spatial, was not created by networks, nor even accompanied by network construction: the set of cities we have studied shows that the situation on the scene of basic networks such as the provision of water is generally better than in society in general: differences in the service were often less important than the general social situation could suggest, which is not to say that there isn't a gap or that it is politically acceptable from our point of view. Networks are just not vectors of segregation, because of

³² Graham and Marvin 2004

the high political and social stakes associated with them. Solutions always have to be found and result in a trend towards universalization through social mediation and negotiation.

Our research illustrates the importance of “urban regimes”, as defined by Stone and Lauria (1997), in the dynamics of urban networks. Indeed, in the context of a “division of labour” between government and private interests, the latter use their influence to obtain public investments for their own benefit, based on the place dependency of government and its obligation to deliver economic benefits to its population³³, as well as satisfy its own need for revenue to maintain and reproduce itself. Thus, the universalization of networks can be seen as a part of the dynamics of urban regimes and their need to compete against other cities, in a regional at first, and then national, and now increasingly global arena, while delivering to their constituents: urban regimes have to “win the hearts” of the population as Harvey Molotch (1976) has shown in his analysis of the “growth machine” in the United States. This shows how the question of official ownership can lose a lot of its relevance in the analysis of the determining factors of universalization: indeed, we can see that urban networks are clearly at the articulation of government and private interests, they are part of strategies that respond to both public and private needs, in other words they are co-products of government and governance. While the building of more or less comprehensive networks of water and power served purely material interests of some parts of society in all of our case studies, especially in the field of land speculation and dynamics of capitalist (sub)urbanisation, we also note that it was also part of the (re)definition of the image of the city: its self-image, as well as the image it was eager to project; thus, the building of networks is also part of a symbolic process of territorial grammar, that is not only economic, but socio-spatial. Thus, in the context of tensions between Cape Town’s British and Dutch elites at the turn of the century, the investment of British capital in “urban renewal”, that is in part in the development of water and power networks targeting specific areas of the city valued by British capital, was designed to equate “britishness” with cleanliness and efficiency, and usher in an era of “modernity”. In Los Angeles, building networks was a step in ensuring the city’s regional dominance over a growing “aqueduct empire” (Starr, 2000). This symbolic aspect of network building, which contributes to the socio-spatial transformation of cities, is also independent from the issue of ownership and connected to the dynamics of urban regimes that link private and public aspects of governance in common strategies.

Our aim was also to try and propose an increasingly complex vision of the political economy of urban utilities. As this domain has generally been read through the dominant lens of ownership, a trend that led to great results in our understanding of network development³⁴, current debates call for the inclusion of new key factors, such as the relationship between local elites and land development; the whole structure of governance (behind the simple government factor); the existence of public policies aimed at controlling urban developments; the political representation of the poorest parts of the population; the possibility of subsidizing private companies in the utilities sector or the role of the ‘civil society’ and its civic relays, which can induce a private company to act according to more complex rules as the ones suggested by an impersonal notion of the market; or the two-way interaction between the sphere of business and society. The rhythm of the history of network governance has long

³³ Which can be defined as the population of stakeholders with a form of representation in the regime; thus, in the case of Cape Town, government had to deliver essentially to rich (White) merchants, whereas in Paris and Rome, and especially in Los Angeles where the population had the capacity to “recall” its officeholders, the government had to answer to a greater part of the population.

³⁴ See, for example : Millward (Robert), « The political economy of urban utilities », in Daunton (Martin) (Ed.) (2000), *The Cambridge Urban History of Britain*, vol. III, p. 315-349.

been structured by a triple sequence of concession / municipalization / privatisation. In order to understand more of the complexity of real life situation, we must go beyond this trilogy, challenging its universal relevance, and try to introduce into the private sphere elements of an analysis based on the social sciences: mediation, negotiation, compromise, consensus. The “universal moment” was not necessarily “monopoly’s moment” everywhere, and even when it was, it might have been for more complex reasons than the mere juxtaposition of terms indicates³⁵.

We also wanted with this paper to confront to the “time factor” in the history of urban utilities networks development, in order to try and nuance some current theories about hot spots and their possible driving effects. Our case studies indeed suggest that fragmentation can be a stage in a development toward universal service. What is important then is not only to describe the moment of the segregation, but also to understand which are the key factors that can lead to the overtaking of it. Was Haussmann’s Paris an hot spot in late XIXth century France, concentrating public and private investment for the greatest benefit of a few. Maybe, but the study of what happened in the surroundings of Paris in the next decades clearly shows that the driving effect worked: the private companies, both for water and power, were induced to serve the suburb with the same level of service. Not only thus thanks to the market, but largely thanks to the organisation of suburban municipalities in syndicates in order to increase pressure on the companies. This might be part of a driving effect itself more complex than the mere mechanics might suggest.

Another point we wish to underline is that, whatever the form of ownership, be it public or private or a combination thereof, utilities supplying essential urban services such as water and power are not submitted to market processes alone, or, conversely, to administrative fiat, but are embedded in dynamics of regulation, as theorized by Aglietta and Lipietz, that span multiple scales of government and governance, and reflect cultural norms and values that are socio-spatially contingent. Indeed, the regulation- which implies the well-known distinction between *régulation* and *réglementation*- of utilities is part of the instable and constantly challenged and therefore rewritten socio-spatial fix to capitalism and its local interpretation, of which urban regimes form a central component.

Governments can choose to impose minimum service requirements to private utilities whereas public utilities can very well be considered cash machines for rentier municipal regimes. Utilities, regardless of their official status of ownership, come under the pressure of the population or activist fractions of the population over particular issues at specific moments in history, whether the issue is urban regime efficiency, public hygiene or social justice. There is a compact, both formal and informal, with the local population, that undergoes perpetual contestation and must be adapted; that is how utilities can be sometimes municipalized, sometimes privatized, as a part of this process of regulation’s ebb and tide. Therefore, one should be weary of attributing too much explanatory power to the notion of ownership, because utilities are embedded in urban societies, both materially and socially, and thus cannot be abstracted from their context.

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³⁵ See : Armstrong Christopher and J.V. Nelles. 1986. *Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830- 1930*. Philadelphia: Temple University Press.

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References

Armstrong Christopher and J.V. Nelles. 1986. *Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830- 1930*. Philadelphia: Temple University Press.

Bickford-Smith, V., "Keeping your own Council: The Struggle between Homeowners and Merchants for the Control of the Cape Town Municipal Council in 1880-1900", Paper presented at the UCT Africa Seminar, August 1983

Bickford-Smith, V., "Cape Town's Dominant Class and the Search for Order, 1891-1902", Centre for African Studies, UCT, 1986

Bickford-Smith, V., "The Origins and Early History of District 6 to 1910", Journal of History Society of Cape Town, Cape Town, 1987

Bickford-Smith, Vivian, *Ethnic Pride and Racial Prejudice in Victorian Cape Town*, Cambridge University Press, 1995.

Calabi (Donatella), "I servizi tecnici a rete e la questione della municipalizzazione nelle città italiane (1880-1910)", in *Le macchine imperfette. Architettura, programma, istituzioni nel XIX secolo*, a cura di P. Morachiello e G. Teyssot, Roma, Officina edizioni, 1980, p. 293-313

Ciampani (Andrea), *Cattolici e Liberali durante la trasformazione dei partiti*, Rome, Archivio Guido Izzi, 2000, 400p.

Deverell W. and Sitton T. (Eds) (1994), *California Progressivism Revisited*, UC Press.

Gaspari (Oscar), Dal monopolio alla municipalizzazione, alla liberalizzazione dei servizi pubblici: le tappe di un processo di sviluppo nel quadro della storia del movimento comunale", *Anci*, 2000

Gottlieb, *Thinking Big, The Story of the Los Angeles Times, Its Publishers, and their Influence on Southern California*, Putnam, 1977.

Graham S., Marvin S., *Splintering Urbanism, Networked Services, Technological Mobilities, and the Urban Condition*, London, Routledge, 2003.

Jackson, Kenneth T. (1987), *Crabgrass Frontier, The Suburbanization of the United States*, Oxford University Press.

MacKillop, F., *L'universalisation des réseaux d'eau et d'électricité à Los Angeles (1780-1940)*, Master's Degree Thesis, Paris, 2003.

MacKillop F., *Water and Power Networks in Cape Town (1840-1920): Selective Diffusion and Urban Fragmentation*, 2004.

Mulholland C., William Mulholland and the Rise of Los Angeles, University of California Press, Los Angeles, 2003.

Poggi (Jolando), “L’energia elettrica”, in De Paolis (Saverio) Ravaglioli (Armando) (eds.), *La Terza Roma*, Rome, Palombi, 1971, p. 199-207.

Sitton, Deverell (eds.), *Metropolis in the Making, Los Angeles in the 1920s*, UC Press, Los Angeles, 2001.

Starr K., *Material Dreams: Southern California Through the Twenties*, Oxford University Press, New York, 1990.

Van Heyningen, E., *Public Health and Society in Cape Town, 1880-1910*, University of Cape Town, 1989.

Archives

Los Angeles Department of Water and Power Archives (1900-1940), Los Angeles City Municipal Archives, Archives of the Los Angeles Public Library; Cape Town Mayor’s Minutes (1840-1920): research carried out by Fionn MacKillop.

Rome: Archivio Storico Capitolino. Ufficio Quinto. Direzione.

Paris: Archives de la Seine. For details, see : Bocquet, Chatzis and Sander, “Integration and Fragmentation in the Universalization Process of the Provision of Water in Paris (1830-1930): A Dissertation on the Possible Splintering Role of Technical Networks”, forthcoming.